
ताप-उत्प्रेरित आसंजक लेपित पॉलिमरिक
टेप — विशिष्टि

भाग 1 पीपीई सूटों पर सीवन सीलिंग

**Heat-Activated Adhesive Coated
Polymeric Tape — Specification
Part 1 For Seam Sealing on PPE Suits**

ICS 83.180

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Price Group 8

FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Plastics Sectional Committee had been approved by the Petroleum, Coal and Related Products Division Council.

Health Care Personnel (HCP) have an increased risk of exposure to disease from close contact with infected patients. During medical procedures and routine visits, pathogens contained in a patient's body fluids (for example, blood, saliva, urine, faeces, or vomit) may lead to infection of HCP. One possible means of exposure to infectious body fluid is by penetration through protective clothing (for example, Surgical gowns or PPE suit). Wherever there is stitching on the suits they are covered with this tape to avoid penetration of virus or bacteria or other pathogens which may easily enter through holes created from stitching.

It is intended to bring out a series of standards on heat activated adhesive tapes for applications related to industrial and medical purposes. This standard will cover the general requirements, methods of test, and specifications for individual materials of heat activated adhesive coated polymeric tape.

The composition of the Committee responsible for the formulation of this standard is given in Annex F.

For the purpose of deciding whether a particular requirement of this standard is complied with the final value, observed or calculated, expressing the result of a test or analysis shall be rounded off in accordance with IS 2 : 2022 'Rules for rounding off numerical values (*second revision*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

HEAT-ACTIVATED ADHESIVE COATED POLYMERIC TAPE — SPECIFICATION

PART 1 FOR SEAMSEALING ON PPE SUITS

1 SCOPE

This standard prescribes the requirements, methods of sampling and test for heat activated adhesive coated on flexible polymeric tape seam sealing in Personal Protective Equipment (PPE) suits.

2 REFERENCES

The following standards contain provisions, which through reference in this text constitute the provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below.

<i>IS No./Other Publication</i>	<i>Title</i>
IS 3434 : 1984	Glossary of terms for adhesives and pressure sensitive adhesive tapes (<i>first revision</i>)
IS 8402 : 1987	Methods of sampling and test for pressure sensitive adhesive tapes (<i>first revision</i>)
IS 13262 : 1992	Pressure sensitive adhesive tapes with plastic base — Specification
IS 16546 : 2016/ ISO 16603:2004	Clothing for protection against contact with blood and body fluids — Determination of the resistance of protective clothing materials to penetration by blood and body fluids — Test method using synthetic blood

<i>IS No./Other Publication</i>	<i>Title</i>
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IS 17423 : 2020	Medical textiles — Coveralls for COVID-19 — Specification
ISO 3801 : 1977	Textiles — Woven Fabrics — Determination of mass per unit length and mass per unit area
ISO 5084 : 1996	Textiles — Determination of thickness of textiles and textile products
ISO 13994 : 2005	Clothing for protection against liquid chemicals — Determination of the resistance of protective clothing materials to penetration by liquids under pressure

3 TERMINOLOGY

3.1 For the purpose of this standard, the definitions given in IS 3434 shall apply. In addition the following definitions shall also apply:

3.2 Body Fluid

Any liquid produced (secreted or excreted) by the body.

3.3 Blood Resistant Material

Material that restricts blood and body fluid penetration.

3.4 Protective Clothing

Item of clothing that is specifically designed and constructed for the intended purpose of isolating all or parts of the body from a potential hazard or isolating the external environment from contamination by the wearer of the clothing.

3.5 Penetration

Flow of liquid through closures, porous materials, seams and holes or other imperfections in a protective clothing material on a non-molecular level.

3.6 Synthetic Blood

Mixture of an amaranth dye, surfactant, thickening agent, inorganic salts, and distilled water having a surface tension and viscosity representative of blood and some other body fluids.

3.7 Polymeric

Mixture of different kinds of plastic polymers.

4 REQUIREMENTS

The heat activated thermoplastic tape shall consist of base plastic polymer film uniformly coated on one side with heat activated adhesive requiring high heat during application on substrate to bond permanently on seam stitching of PPE Suits.

The rolls shall be uniformly wound on cores so that each layer coincides with one below it. Each roll of tape shall be reasonably free from telescoping, distortions, folds from overlapping and shall unwind without transfer of the adhesive mass on succeeding layer or tearing of base film.

4.1 Workmanship and Finish

The adhesive tape shall be clean and free from substances which is liable to cause interference in subsequent operations for end requirements. The manufacture and preparation of the tape shall be conducted under proper hygienic conditions.

4.2 Colour

The colour of the tape shall be *Pantone 15-5217 TCX Blue Turquoise* and same shall be visually matched with

reference colour from the Pantone shade card.

NOTE — Tape shall not be of red colour as it matches with colour of blood.

4.3 Printing

Printing on the tape shall be as agreed between the purchaser and the supplier. The printing on the tape shall be done on outer side as specified by customer and shall be legible and shall not transfer to the adhesive side of the succeeding layer.

NOTE — There shall be no printing on adhesive side.

4.4 Cores

All tape shall be wound on cores of internal diameter 75.0 ± 1.5 mm.

4.5 Width

The minimum width of the tape shall be 20 mm and shall be determined as per 6.2 of IS 7809 (Part 1). More than 20 mm width should be specified by the buyer, if required. None of the five observations for width shall fall outside the tolerance limit given below. The width shall be determined by taking five readings at random in a length of not less than one meter of tape from each sample roll.

<i>Nominal Width</i>	<i>Tolerance</i>
(in mm)	(in mm)
20 to 24	-0.5/+1.0
>24 and up to 100	± 1.0

4.6 Length

The standard length of the roll shall be 50 m, 100 m and 200 m. The length of the roll shall not vary by more than ± 1.0 m from specified length, when determined by unrolling the roll on a suitable winding machine fitted with a length meter capable of measuring up to 0.1 m. The length of

the tape roll can also be as agreed between the buyer and the supplier.

4.7 Splices

A roll of tape shall not have more than one splice in 50 m and not more than two in a roll. The splice should be so made that during unwinding the film should not break due to the failure of the splices. Preferably butt-joint to be made with splicing tape on top and not on adhesive side. The measured splices shall be in accordance with 5.7 of IS 13262.

4.8 Thickness

Thickness shall be measured in accordance with IS 7809 (Part 2). Minimum thickness of film shall be 0.065 mm with tolerance of ± 10 percent. However higher film thickness can be used with tolerance of ± 10 percent. Minimum adhesive coating thickness shall be 0.050 mm with tolerance of ± 10 percent. Total thickness is $0.115 \text{ mm} \pm 10$ percent. The measured thickness shall be in accordance with 3 of IS 7809 (Part 2).

4.9 Adhesive Strength on the Fabric

After application of the tape, the failure mode while removing the tape shall be fibre tear from the fabrics which will indicate there is no bond failure between the fabric and tape. The test shall be performed as per Annex A.

4.10 Application Temperature on Fabric

The application temperature of the tape on the fabric shall be in the range of 300°C to 600°C when measured as per Annex B.

4.11 Synthetic Blood Penetration Resistance Test

The tape shall pass the test when tested as per IS 16546. The procedure for the penetration resistance test is given in Annex C.

4.12 Durability

The tape shall pass the test as prescribed in Annex D.

4.13 Stability

The tape shall part neatly from the under layer and shall show no evidence of deterioration in the adhesive or backing so as to make the tape unfit for use when aged as prescribed in Annex E. The adhesion to non-woven fabric and self shall not decrease when determined by the method prescribed in 4.9 and 4.11 respectively.

5 STORAGE LIFE

The rolls when stored on their cut edges in original unopened containers at $25 \pm 2^{\circ}\text{C}$ and 65 ± 5 percent relative humidity shall continue to comply with the requirements prescribed in 4 for a minimum period of one year from the date of manufacture.

6 PACKAGING AND MARKING

6.1 Packaging

The rolls shall be packed in polypropylene bag so that they are protected from dirt, oil and grease. The final packing is in expanded polystyrene boxes and corrugated box to protect tapes from heat and humidity in transportation and from deterioration due to climatic conditions.

6.2 Marking

Each corrugated box shall be marked legibly with the following information:

- a) Name and type of material;
- b) Indication of source of manufacture;
- c) Month and Year of manufacture;
- d) Length and width of the tape;
- e) Batch number of manufacture; and

- f) Directions for storage and use.

6.3 BIS Certification Marking

The product(s) conforming to the requirements of this standard may be certified as per the conformity assessment schemes under the provisions of the *Bureau of Indian Standards Act, 2016* and the Rules and Regulations framed thereunder, and the products may be marked with the Standard Mark.

7 SAMPLING AND CRITERIA FOR CONFORMITY

7.1 The scale of sampling shall be as per **3** of IS 8402.

7.2 Number of Tests

Test for the determination of all the requirements of the specification given in **4** shall be performed on each of individual sample rolls separately.

7.3 Criteria for Conformity

The lot shall be declared as conforming to the requirements of the specification if different test results as obtained in **4** meets the corresponding requirements given in the standard.

ANNEX A*(Clause 4.9 and E-3)***ADHESIVE STRENGTH ON THE FABRIC****A-1 GENERAL**

Adhesion strength is determined by finding the force required to peel a strip of tape from a non-woven fabric used to make PPE suits with or without PE lamination at a specified angle and speed.

A-2 NUMBER OF TESTS

Carry out the determination on five test specimens taken from the same roll.

A-3 APPARATUS

A-3.1 Tensile Testing Machine — A pendulum or spring balance type tensile testing machine, with a uniform rate of travel of 10 cm/min of the moving head or carriage, and a scale graduated to 0.05 kg or less.

A-3.2 Fabric — Rectangular, 20 cm × 50 cm non-woven fabric with or without PE lamination.

A-4 PROCEDURE

A-4.1 The fabric shall be cut in the lengthwise direction. Mark fabric at interval of 2 cm in longitudinal direction.

A-4.2 A heat activating and bonding machine is used (*see* Fig. 1). Mount the tape roll. Start the heater and air pressure.

Once desired temperature is reached, apply the tape on fabric. Follow instruction mentioned in the machine manual. Leave free hand to fix in one of the jaw on Universal Testing Machine (UTM).

A-4.3 Allow the non-woven fabric with the test specimen to remain undisturbed for 10 ± 0.5 min at a temperature of 27 ± 2 °C and 65 ± 5 percent relative humidity.

A-4.4 Fold the free end of the test specimen at an angle of 180°. Clamp exposed end of the non-woven in the lower jaw (while using a vertical pendulum or spring balance type machine) or attach the whole specimen to the moving carriage (if the testing machine is of the horizontal type). Attach the free end of the tape to the head of the tension measuring device and disengage the pawls, if any. Start the tensile testing machine and take readings at 2 cm intervals when the tape is pulled from the non-woven fabric, disregarding the pulling of first 5 cm and last 3 cm. The mean of five readings shall give the results for individual test specimens, that is, the load required to cause the separation of the tape from the non-woven. If the specimen breaks during the test, repeat the test on another specimen cut from the same roll.



FIG. 1 HEAT ACTIVATING AND BONDING MACHINE

A-5 CALCULATION AND REPORTING

Calculate the load required to cause the separation of the tape from the non-woven in terms of kg/cm width. If the variation of any of the five results exceeds ± 10

percent of the mean of the five results, all of them shall be discarded and a further set of five test specimens shall be tested. The mean of the fresh five values obtained shall be reported as adhesion strength to the non-woven fabric.

ANNEX B*(Clause 4.10 and D-5.1)***APPLICATION TEMPERATURE ON FABRIC****B-1 GENERAL**

Application temperature is found so as to get very good seam sealing and shall pass the blood penetration test.

B-2 NUMBER OF TEST

Carry out the determination on five test specimens taken from the same roll.

B-3 APPARATUS

B-3.1 Fabric — Rectangular piece of non-woven fabric from PPE suit with seam (stitch) in the size of 20 cm × 50 cm.

B-3.2 Machine**B-4 PROCEDURE**

Adjust air pressure on the machine between 5 kg/cm² to 6 kg/cm². 3 HP air compressor is used to get correct air

pressure. Check nozzle pressure and set it to 1 kg/cm². Mount the tape as shown in machine manual. Switch ON the power. Set air nozzle temperature to 300°C. Switch ON upper roller heater. Set speed to 5 mpm (metres per minute) for 2 layer fabric and 3 mpm for 3 layer fabric. Start machine and apply heat activated tape to fabric. Leave small portion of tape free. Allow to cool for 30 min at room temperature. Pull tape to check adhesive bond. In case of failure repeat the test by increasing air nozzle temperature by 25°C till correct bond is not achieved. Make five samples to check consistency of the process.

B-5 REPORTING — Record temperature, air pressure, speed and other findings.

ANNEX C

(Clause 4.11)

SYNTHETIC BLOOD PENETRATION RESISTANCE TEST

C-1 PRELIMINARY MEASURES

C-1.1 Measure the thickness of each specimen to the nearest 0.02 mm in accordance with IS 7809 (Part 2).

C-1.2 Determine the mass of each specimen and calculate the mass per unit area to the nearest 10 g/m² in accordance with ISO 3801.

C-1.3 Place a small droplet (10 µl) of the synthetic blood on the normal inside surface of an extra piece of the material to be tested. The droplet shall remain easily visible to ensure that a droplet that penetrates the material will be seen.

NOTE — In order to enhance droplet visibility, alternative methods can be used, such as talcum powder or an oblique light source.

C-2 TEST APPARATUS SETUP

C-2.1 With the cell placed horizontally on the lab bench, insert the specimen in the penetration cell with the normal outside surface of the fabric toward the cell reservoir which will be filled with synthetic blood.

Use a retaining screen in the normal inside surface of the sample to support extensible or elastomeric materials.

C-2.2 Assemble the components of the cell as follows:

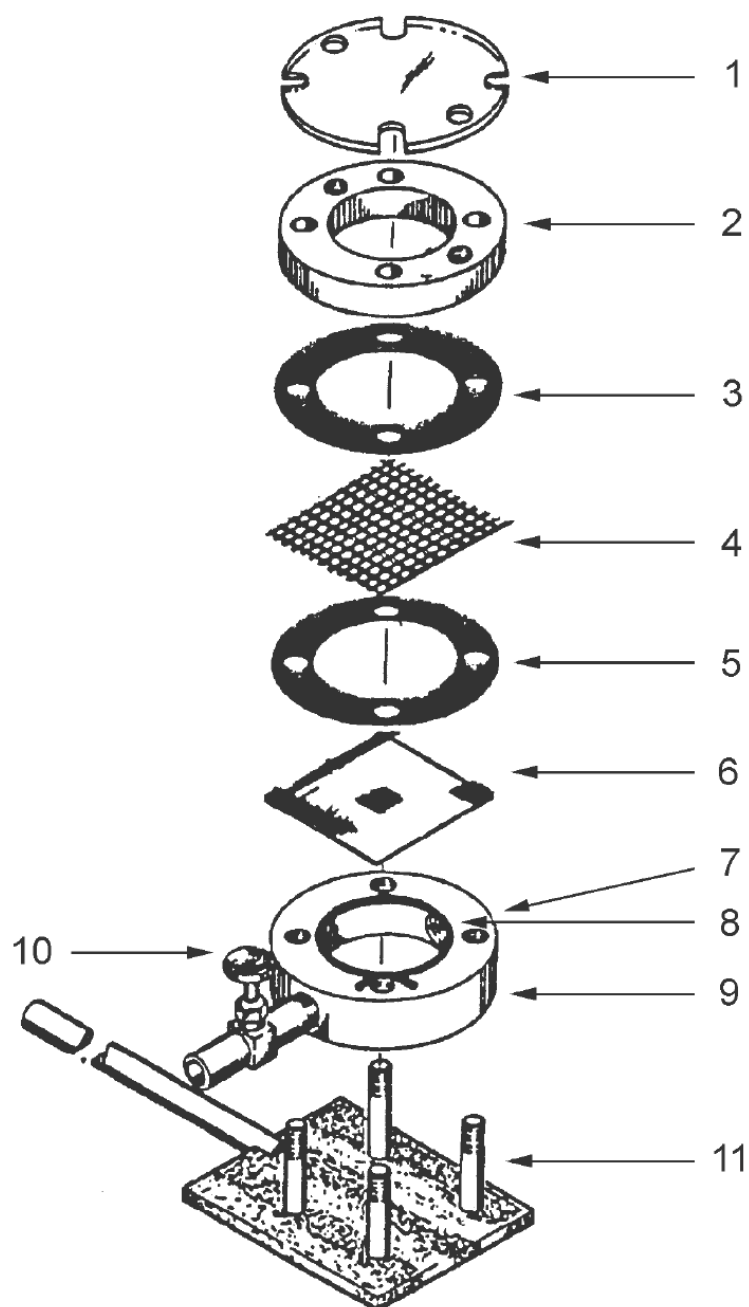
- a) Place gaskets between the penetration cell and the test specimen, the specimen and the retaining screen (if used), and the retaining screen and the flange cover as shown in Fig. 2;
- b) Close the penetration cell by putting on the flange cover and transparent cover. Polytetrafluoroethylene (PTFE) gasket material is recommended for use between the cell body and the test specimen to help prevent leakage.

NOTE — Clear plastic film is an acceptable substitute for the transparent cover.

C-2.3 Torque the bolts in the test cell to 13.6 Nm each.

C-2.4 Mount the penetration cell in the test apparatus in a vertical position as shown in Fig. 3 (drain valve down) but do not connect the airline to the cell.

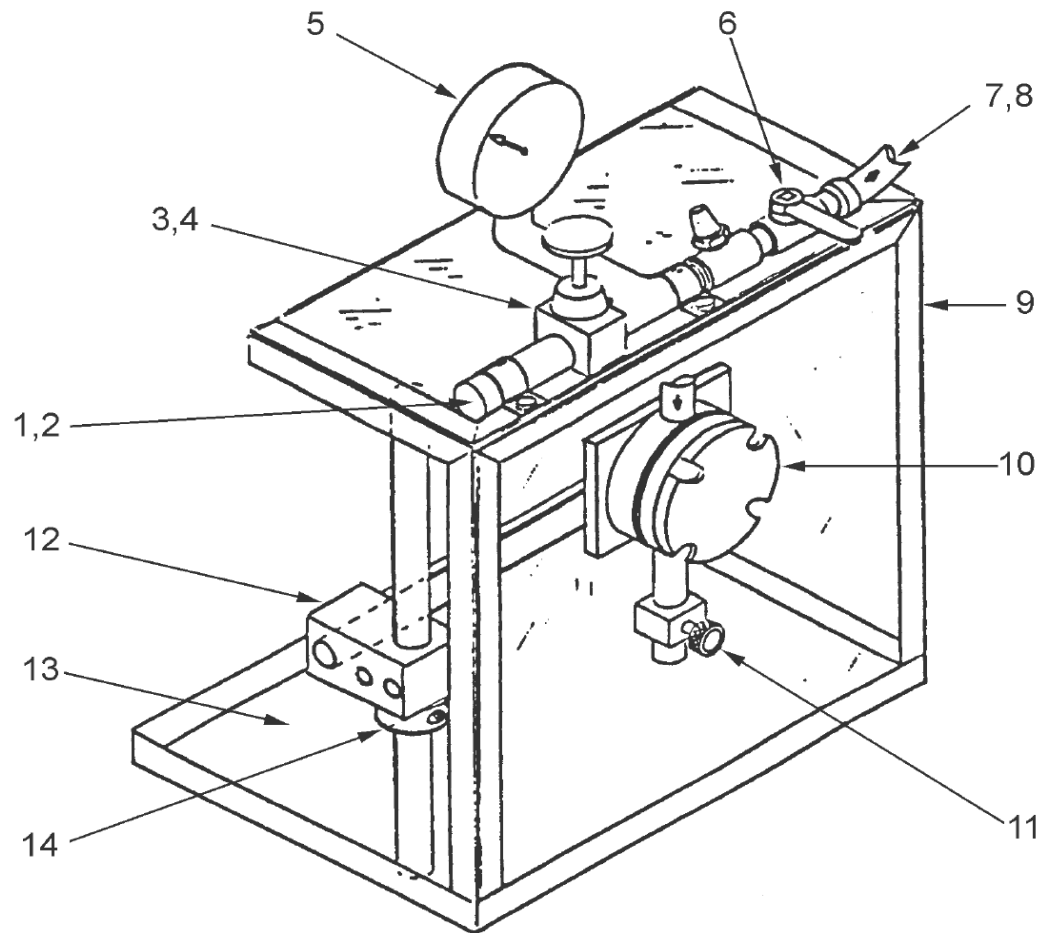
C-2.5 Close the drain valve.



Key

- | | |
|---|---------------------------------|
| 1 Transparent cover | 8 Expanded PTFE gasket material |
| 2 Flange cover | 9 Cell body |
| 3 Gasket (specimen exposure Procedures B & D) | |
| 4 Retaining screen (specimen exposure Procedures B & D) | |
| 5 Gasket | 10 Drain valve |
| 6 Test sample | 11 Cell support |
| 7 Top port | |

FIG. 2 PENETRATION TEST CELL WITH RETAINING SCREEN



Key

- | | |
|--|---------------------------|
| 1 Compresses air or nitrogen | 9 Safety enclosure |
| 2 Air line connector | 10 Penetration test cell |
| 3 Air pressure regulator | 11 Drain valve |
| 4 Adjustable relief valve | 12 Swivel clamp |
| 5 Pressure gauge | 13 Spill pan |
| 6 Cell vent valve | 14 Two-piece shaft collar |
| 7 Female coupling | |
| 8 Rubber air hose with male coupling to connect to 7 and a female coupling to connection to 10 | |

FIG. 3 TEST APPARATUS

C-3 TEST PROCEDURE

C-3.1 Select an appropriate procedure from Table 1.

Table 1 Time and Pressure Protocols
(Clause C-3.1)

Sl No. (1)	Procedure (2)	Pressure and time sequence (3)	Remarks (4)
i)	A	0 kPa for 5 min, followed by 14 kPa for 1 min, followed by 0 kPa for 4 min. A retaining screen is not used to support the sample.	Used for selecting critical zone materials and components to limit exposure in situations involving presence of a large amount of blood or body fluids, a direct liquid contact, pressing and leaning.
ii)	B	0 kPa for 5 min, followed by 14 kPa for 1 min, followed by 0 kPa for 4 min. A retaining screen is used to support the sample.	Procedure B involves the use of a retaining screen to support extensible or elastomeric materials. When distortion of the test material is suspected of causing failure with procedure A, procedure B may be used.
iii)	C	0 kPa for 5 min, followed by 1.75 kPa for 5 min, followed by 3.5 kPa for 5 min, followed by 7 kPa for 5 min, followed by 14 kPa for 5 min, followed by 20 kPa for 5 min. A retaining screen is not used to support the sample.	Used for selecting critical zone materials and components to limit exposure in situations involving presence of blood or body fluids and different possible levels of contact pressure. A selection as to which level of protection is required should be made, based on a task analysis and on the degree of exposure anticipated.
iv)	D	0 kPa for 5 min, followed by 1.75 kPa for 5 min, followed by 3.5 kPa for 5 min, followed by 7 kPa for 5 min, followed by 14 kPa for 5 min, followed by 20 kPa for 5 min. A retaining screen is used to support the sample.	Procedure D involves the use of a retaining screen to support extensible or elastomeric materials. When distortion of the test material is suspected of causing failure with procedure C, procedure D may be used.

C-3.2 Carefully fill the chamber of the penetration cell through the top port with approximately 60 ml of synthetic blood (a syringe or funnel is useful). If liquid penetrates through the test specimen at any time during the test, terminate the test.

C-3.3 Connect the airline to the penetration cell.

C-3.4 Set the pressure regulator to a pressure of 0 kPa and close the cell vent valve.

C-3.5 Expose the test liquid to the pressure(s) and for the time(s) called for, in the desired procedure from Table 1, changing the pressure at the rate of no more than (3.5 ± 0.5) kPa/s. Hold the pressure constant at each specified level for the specified time.

C-3.6 Observe the viewing surface of the specimen at the end of each specified pressure and time interval for the appearance of synthetic blood or other evidence of wetness. If this occurs, terminate the test. If selected, record the time and pressure of failure.

If there is no visible penetration, continue on to the next step of the time and pressure protocol.

If no liquid or characteristic discoloration appears for the duration of the test, then the specimen passes the test.

C-3.7 At the conclusion of the test, turn off the pressure and open the cell valve to the vent position.

C-3.8 Test the remaining specimens.

C-4 FINAL CLEAN-UP OF TEST APPARATUS

At the end of the test period, open the drain valve and drain the penetration test cell of the synthetic blood.

Flush the test cell with an appropriate wash liquid to remove any traces of the

synthetic blood. Remove the specimen and gasket from the cell. Clean any external parts of the test cell which may have been touched by synthetic blood.

C-5 TEST REPORT

The test report shall include the following information:

- a) A reference to this Indian Standard;
- b) The manufacturer's identity and the identification of the material tested (supplier, lot number and date of receipt);
- c) A description of the sampling method used, for example, if the material was taken from roll goods or garments;
- d) The characteristics of the material:
 - i) The composition of the material types of fibres and coatings, presence of seams or other conditions, etc;
 - ii) The position on the garment of each specimen shall be indicated if the specimens were taken from garments,
 - iii) Whether the material was subjected to sterilization and, if so, the sterilization procedure;
- e) The thickness of each material specimen and the average thickness of the material tested (in millimetres);
- f) The mass per unit area of each material specimen and the average mass per unit area of the material tested (in grams per square metre);
- g) A description of any technique used to enhance visual detection of synthetic blood penetration;

- h) The procedure selected (from Table 1);
- i) The type and specification of the retaining screen, if used;
- j) The “pass” or “fail” result for each specimen at each time and pressure interval;

- k) The time of failure for each specimen (if elected to report).

The manufacture should generate the test report and share with the buyer for the compliance of the Standard.

ANNEX D
(Clause 4.12)
STABILITY

D-1 GENERAL

This test method defines conditions for determining the performance of adhesive bonds when subjected to continuous exposure at specified conditions of moisture and temperature. The performance is expressed as a percentage based on the ratio of strength retained after exposure to the original strength.

D-2 APPARATUS

D-2.1 Conditioning Cabinets or Ovens — Capable of maintaining a temperature of $50\text{ }^{\circ}\text{C} \pm 1\text{ }^{\circ}\text{C}$.

D-2.2 Sealing Machine — same as in Fig. 1.

D-3 PREPARATION OF TEST SAMPLE

Take 300 mm × 500 mm PPE fabric sample free from dust and contamination. Allow the PPE fabric to cool for about 30 min at $27 \pm 2\text{ }^{\circ}\text{C}$ and 65 ± 5 percent relative humidity prior to the test.

D-4 PRE-CONDITIONING OF ROLL

Condition the roll of tape at $27 \pm 2\text{ }^{\circ}\text{C}$ and 65 ± 5 percent relative humidity for 24 h. Take out 60 cm of tape radially from the reel at a rate of 30 cm/min if the width of tape is 20 mm. If the width is more than 20 mm, remove the tape radially from the reel at the rate of 15 to 20 cm/min and cut to 20 mm width with sharp blade. The test piece shall not be allowed to touch any object prior to application.

D-5 PROCEDURE

D-5.1 Apply tape to test sample fabric same as given in annex B. Allow the test fabric with applied test tape to remain undisturbed for 5 to 6 min at $27 \pm 2\text{ }^{\circ}\text{C}$ and 65 ± 5 percent relative humidity.

D-5.2 Suspend the fabric with applied test piece for 7 days in a conditioning cabinet or oven in which the temperature is maintained at $50 \pm 1\text{ }^{\circ}\text{C}$ and relative humidity 80 percent. At the end of this period, examine whether the tape remains firmly adhered to the fabric.

D-6 CALCULATIONS

$$\text{Percent decrease in adhesion strength} = 100 - (A/B \times 100)$$

where

A = average strength when tested under the designated exposure conditions as given in 4.9;

B = original strength determined as prescribed in 4.9.

D-7 REPORTING

To pass the test, the tape shall remain firmly adhered to the surface of plate 1 and the edges shall not show signs of lifting from position. The adhesion strength of the tape when determined under the designated exposure conditions shall not decrease by more than 12 percent of the original value.

ANNEX E

(Clause 4.13)

DETERMINATION OF STABILITY

E-1 GENERAL

Stability is determined by finding the adhesion strength of the tape after ageing at 50 ± 1 °C for one week.

E-2 APPARATUS

E-2.1 Hot Air Oven — Electrically operated, capable of being maintained at 50 °C.

E-3 PROCEDURE

Place the rolls of tape in an oven maintained at a temperature of 50 ± 1 °C for a period of one week. At the end of this period, condition these rolls at 27 ± 2 °C and 65 ± 5 percent relative humidity for 24 h. Determine the adhesion strength as prescribed in annex A.

E-4 REPORTING — Report the percent decrease in adhesion strength, if any, due to ageing.

ANNEX F

(Foreword)

COMMITTEE COMPOSITION

Plastics Sectional Committee, PCD 12

<i>Organization(s)</i>	<i>Representative(s)</i>
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Central Pollution Control Board, New Delhi	MS DIVYA SINHA SHRI C. K. DIXIT (<i>Alternate</i>)
Chemical and Petrochemical Manufactures Association (CPMA), New Delhi	SHRI MAHINDER SINGH
Coca-Cola India Pvt Limited	SHRI VIRENDRA LANDGE SHRI RAJENDRA DOBRIYAL (<i>Alternate</i>)
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CSIR-Indian Institute of Toxicological Research (IITR), Lucknow	DR V. P. SHARMA DR A. B. PANT (<i>Alternate</i>)
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Food Corporation of India (FCI), Delhi	SHRI RAJAGOPAL A. SHRI A. K. U. B. SINGH (<i>Alternate</i>)

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HPCL–Mittal Energy Limited (HMEL), Noida	SHRI VINEET KUMAR GUPTA SHRI ALAKESH GHOSH (<i>Alternate</i>)
Huhtamaki Paper Product Limited (HPPL), Hyderabad	SHRI MUTHUSAMY CHOCKALINGAM SHRI AISHWARYA VANGE (<i>Alternate</i>)
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Shivalik Agro-Poly Products Limited., Mohali	SHRI PANKAJ KUMAR MAHAJAN DR G. D. TYAGI (<i>Alternate</i>)
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The Toy Association of India (TAI), New Delhi	SHRI RAJESH ARORA SHRI R. K. VERMA (<i>Alternate</i>)
Voluntary Organization in Interest of Consumer Education (VOICE), New Delhi	SHRI M. A. U. KHAN SHRI H. WADHWA (<i>Alternate</i>)
BIS Directorate General	SHRIMATI NAGAMANI T., SCIENTIST 'E' AND HEAD (PCD) [REPRESENTING DIRECTOR GENERAL (<i>Ex-officio</i>)]

Member Secretary

SHRI SHIVAM DWIVEDI
SCIENTIST 'B' (PCD), BIS

Panel for Preparing Standard on Adhesive Tape

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